IMPROVEMENTS IN OR RELATING TO CONTAINERS AND METHODS OF PRODUCTION THEREOF

10/507400

This invention relates to a container and to a method of production thereof.

The use of injection-moulded preforms in blow-moulding, particularly stretch blow-moulding of packaging container bodies for fluid products, particularly liquid products, is well known. It is also known, after filling of the container bodies, to apply foils to the axially outermost extremities of the open ends of the container bodies, especially in ultra-clean and aseptic packaging conditions, or, alternatively, to apply snap-on closures with frustum or so-called "valve" seals for secondary and primary sealing to the container bodies and so benefit from the associated weight-saving in the preform. The container bodies are usually in the form of bottles and made of PET (polyethylene terephthalate).

Another well known method of forming packaging container bodies is continuous extrusion blow-moulding in which a parison is extruded into a mould and then inflated to form the container body. It is again known, after filling of the container body, to apply a foil to the axially outermost extremity of the open end or, alternatively, to apply snap-on closures with valve seals. The container bodies are usually in the form of bottles and made of HDPE (high density polyethylene) or of multilayer plastics material.

According to a first aspect of the present invention,

there is provided a hollow preform for moulding to form a container and having an open end, an axially outermost extremity of said open end, and a shoulder inside said preform at said open end, having a radially innermost diameter less than the internal diameter of said outermost extremity, and serving to have sealingly attached thereto a foil for closing said container at said shoulder.

According to a second aspect of the present invention, there is provided a container comprising:-

a hollow body having a mouth end, an axially outermost extremity of said mouth end, and a shoulder providing a plastics surface inside said body at said mouth end and having a radially innermost diameter less than the internal diameter of said outermost extremity, and

a foil closing said body at said shoulder and sealingly attached to said plastics surface.

According to a third aspect of the present invention, there is provided a method comprising:-

forming a hollow body,

filling said hollow body with a product, and

closing said body with a foil, including sealingly attaching said foil to a plastics surface provided by a shoulder which is located inside said body at a mouth end of said body and which has a radially innermost diameter less than the internal diameter of the axially outermost extremity of said mouth end.

Owing to these aspects of the invention, the outermost

extremity of the mouth end of such container containing a fluid product need not be deleteriously affected, in respect of its pouring properties and its consumer "feel", by application and removal of the foil.

The hollow body can have been made by blow-moulding from a plastics preform or by blow-moulding of a plastics parison.

The shoulder may be of planar form and extend in a radial plane; alternatively it may be of rounded form, especially at its inner periphery, or of frusto-conical form and co-axial with the mouth. If of frusto-conical form, it may be inwardly converging, commencing even at the axially outermost extremity of the mouth.

The foil is preferably a laminate comprised of metal, particularly aluminium, sandwiched between two differing plastics materials of which one has a significantly higher melting point than the other.

According to a fourth aspect of the present invention, there is provided a method of producing a sealed container, comprising providing a hollow preform having an open end, moulding said preform to form a hollow body having said open end, sealingly attaching a foil to said open end of said hollow body so as to close said body at said open end, and applying over the foil a removable closure so that an annular portion of said closure co-operates with an annular portion of said hollow body to provide a frustum seal therebetween.

According to a fifth aspect of the present invention, there is provided a container comprising a hollow body

moulded from a preform, a foil sealingly attached to a mouth end of said body so as to close said body at said mouth end, and a removable closure applied over the foil, an annular portion of said closure co-operating with an annular portion of said body so as to provide a frustum seal therebetween.

Owing to these two aspects of the invention, it is possible to provide for a container a good primary seal in the form of the foil, which is at least partly removed by peeling or rupturing when the hollow body is first opened, and a good secondary seal in the form of the frustum seal, which is restored upon re-closing of the hollow body with the removable closure.

Furthermore, if the removable closure is in the form of a snap-on closure, as opposed to a screw closure, a significant weight saving in the preform and thus in the hollow body can be achieved because of the omission of the screw threading.

If both the closure and the preform are produced by injection moulding, relatively tight manufacturing tolerances can be achieved, so that the valve seal is, generally, highly effective.

According to a sixth aspect of the present invention, there is provided a method comprising punch-forming a pull tab from a laminate, folding said pull tab back over a disc-form main body of said laminate so that said tab extends in a gradual curve from said main body, punching-out said main body with said tab and displacing said tab away from said

main body so as to leave a space therebetween, applying a liquid sterilant to said space, and drying the liquid sterilant from said space.

According to a seventh aspect of the present invention, there is provided a foil comprising a disc for closing a mouth, and a pull tab extending from the periphery of said disc back over said disc so that said tab extends in a gradual curve from said periphery and then at a spacing from said disc, said curve and said spacing being such that an aqueous liquid in the space defined by the tab and the disc does not persist therein under capillary action.

According to an eighth aspect of the present invention, there is provided a foil comprising a disc for closing a mouth, and a pull tab extending from the periphery of said disc back over said disc so that said tab extends in a gradual curve from said periphery and then at a spacing from said disc, said curve and said spacing being such that a liquid sterilant in the space defined by the tab and the disc does not persist therein under capillary action.

According to a ninth aspect of the present invention, there is provided a foil comprising a disc for closing a mouth, and a pull tab extending from the periphery of said disc back over said disc so that said tab extends in a gradual curve from said periphery and then at a spacing from said disc, said curve having an internal radius of at least one-half of a millimetre and said spacing being at least one millimetre.

Owing to these four aspects of the invention, it is possible to avoid a liquid in the space between the tab and the disc from persisting there under capillary action.

The internal radius of the gradual curve is preferably about one millimetre.

In order that the invention may be clearly and completely disclosed, reference will now be made, by way of example, to the accompanying drawings, in which:-

Figure 1 is a perspective view, in axial section, through an injection-moulded, thermoplastics preform,

Figure 2 is a perspective view, in axial section, illustrating a snap-on closure, a laminate foil, and, fragmentarily, a hollow body, of a container, the hollow body having been blow-moulded from the preform,

Figure 3 is a view similar to Figure 2 but showing the body, the foil and the closure assembled to form the container,

Figure 4 is a fragmentary axial section through the top of the assembled container, and

Figure 5 is a view similar to Figure 4 through an upper part of the assembled container but incorporating a modified version of the foil.

Referring to the drawings, the open, top end 4 of the preform 2 forms an unaltered, open, top end of the hollow body 6 formed by stretch blow-moulding of the preform 2, and remains substantially unaltered after the foil 8 has been sealingly attached thereto and the snap-on closure, in the

form of an overcap 10, has been applied thereto.

At its axially outermost extremity 12, the end 4 is formed with an easy pouring feature consisting of a thin, radially outwardly thinning, curled-over, annular lip 14. Below that lip is a thicker, snap ring 16 which, with an external, narrow, annular shoulder 18 delimits an external, shallow, annular recess 20 co-axial with the preform 2 and serving as a main securing point for the overcap 10. At the inside of the preform 2 and immediately beyond the extremity 12 is a frusto-conical surface 22 which tapers slightly axially inwardly of the preform 2 and acts as a guide for the foil 8 during application and as the valve seal of the overcap 10. Below the external shoulder 18 is an additional snap ring 24 as a secondary securing point for the overcap or, alternatively, for retaining a tamper band 26. The surface 22 terminates at an annular, radial, flat surface 28 on the inside of the preform and constituting a shoulder onto which the foil 8 is welded to close the body 6 at its end 4. Below the ring 24 is a neck support ring 30 used for handling of the preforms 2 and the hollow bodies 6.

The foil 8 is of aluminium 32 laminated on both sides with plastics materials of which one (34) has a significantly higher melting point than the other (36), in such a way as to give an easily peelable laminate 36 on the hollow body side and, on the other side, a laminate 34 that can withstand substantial heat and does not cause contamination of an applicator used for applying the foil 8 to the body 6.

Conduction heat sealing or induction heat sealing can be used for the application. The foil 8 consists of a circular disc 38 with a tab 40 projecting unilaterally therefrom. The tab 40 would be designed in such a way that it effects an even tear after application of the foil, without the foil leaving any residue on the shoulder 28.

The foils are pre-cut from a laminate web and delivered in packs to a packager. These packs are then loaded into one or more magazines on a filler. If the filler has more than one line, the magazine has sub-sections equal in number to the number of lines on the filler. If the filler is multi-indexing, i.e. in the or each line a plurality of containers is filled simultaneously, then either the magazine has sub-sections equal in number to the number of containers filled simultaneously or a plurality of magazines is equal in number to the number of containers filled simultaneously and each magazine has sub-sections equal in number to the number of lines. Each magazine is designed in such a way that it can be reloaded during production without interference with production.

A pick-and-place unit is used to remove the foil 8 from the magazine and place it in a sterilising chamber where the foil is sterilised on both sides with, for example, a liquid sterilant such as hydrogen peroxide solution. The foil is then picked from the sterilising chamber by a welding anvil of the applicator and through applying vacuum. The anvil then places the foil into the body 6, pressing it onto the flat

surface 28. The foil is welded through conduction or induction heat. The lead-in 22 on the neck assists in the accurate and consistent placing of the foil 8 and reduces the accuracy required in the filler positioning.

In the version shown in Figures 2 to 4, the foil 8 supplied to the magazine is planar and is welded in that planar form to the surface 28. The rim bounded by the extremity 12 and the surface 22 acts as a folding device for the tab 40 on the disc 38 and this action tends to leave the tab 40 bent upwards. A mechanism would then be used to fold the foil tab 40 back over the disc 38 either immediately after application of the disc, or later during forward indexing of the hollow body 6.

In the version shown in Figure 5, the foil 8 supplied to the magazine has been drawn to give its disc 38 a dished form with an annular side wall 38a converging frustoconically towards the planar base wall 38b of the disc. Moreover, the foil 8 as supplied to the magazine and as shown has its tab 40 extending inwards from the periphery of the disc in a gradual curve 40a and then generally radially inwards at a roughly constant spacing from the dished surface of the disc 38. The frustoconical external surface of the wall 38a assists in centering the disc 38 with respect to the should 28 during application.

To produce the tab as shown in Figure 5, the tab 40 is punched-formed from the laminate in a punching unit and there folded back onto the main body, i.e. what will be the disc

38, with a small internal radius on the fold 40a and then the tab 40 is lifted slightly from the main body in order to have some clearance between the folded tab and the disc 38, which exists once the foil 8 has been punched from the laminate. In this way, not only is the liquid sterilant able to penetrate to throughout the space between the tab 40 and the disc 38, but also the liquid sterilant is not able to persist in that space under capillary action, so that the space can be both well sterilized and then well dried without leaving sterilant residue. The lifting of the tab 40 from the main body could be achieved by means of an air blast inside the punching unit, mechanically or otherwise. The small internal radius is at least 0.5mm., preferably 1mm., whilst the clearance is at least 1mm.

The overcap 10 can be a lightweight snap-on closure and need not have any specific, built-in, gas barrier properties. The overcap has a flexible, internal, co-axial skirt that co-operates with the surface 22 to provide the valve seal that gives secondary sealing functionality.

The overcap 10 is applied over the disc 38 so as to leave a space therebetween, and the tab 40 extends in only that space from the outer peripheral edge of the disc. Thus, the tab 40 does not extend to between mutually co-operating surfaces of the body 6 and the overcap 10 and thus does not interfere with such co-operation.

A tamper evidence band (26) could be built into the closure and would be designed in such a way that it is

removed completely from the container after opening. Of the two snap rings 16 and 24, the ring 16 acts as the main location point for the overcap 10. This ring 16 does not project significantly from the base of the recess 20, and therefore the overcap 10 is made strong enough in this section to stay on the body 6. The snap ring 24 further down the neck acts as an additional protrusion to secure the overcap during transport and handling and to retain the tamper band 26.

The overcap 10 could be applied outside the filler on a free-standing cap applicator. The control of this applicator could be integrated with that of the filler.

This overcap principle permits the applying of various cap designs with the same internal design features. This is beneficial should packagers require some branding feature on their closures. Also, a change in the overcap need not have an impact on the filler integrity since the overcap would not need to be sterilised and the cap applicator could be integrated with the filler only through electronic control.

As shown in Figure 3, the final assembly presents a foil-sealed container body 6 with a snap-on overcap 10.

The container described with reference to the drawings has the following features:-

1) A recess inside the hollow body 6 with a shoulder 28 onto which the foil 8 is placed and welded.

2) An easy-pouring, non-drip feature 14 incorporated in the pouring rim.

3) A snap-on overcap 10, with a valve seal 22/42 for good secondary sealing.

4) This overcap 10 has external tamper evidence 36, that could function in such a way that no parts remain on the body 6 after opening.

5) A peelable foil 8, cut in such a way that a pull tab 40 is provided as part of the foil.

6) The foil 8 is a laminate designed in such a way that it provides an integral gas-and liquid-tight seal.

7) The foil is easily removed without tearing, no foil remaining on the container body 6 and no risk of foil falling into the container body 6.

8) With no foil left on the container body, the latter is more suitable for recycling than if a portion of the foil were to remain on the body.

9) Foil application is designed not to affect the pouring surface or consumer "feel" after peeling.

10) The foil acts as main tamper evidence.

11) A weight saving in the preform of between 10 and 15% is obtained when compared with current, standard, three-start thread necks, assuming, of course, that the non-neck parts of the container bodies are of equal weight to each other.